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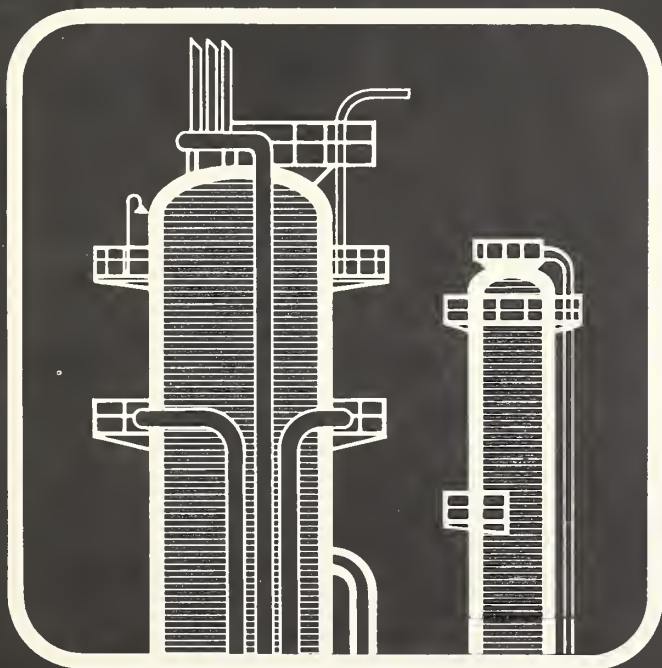
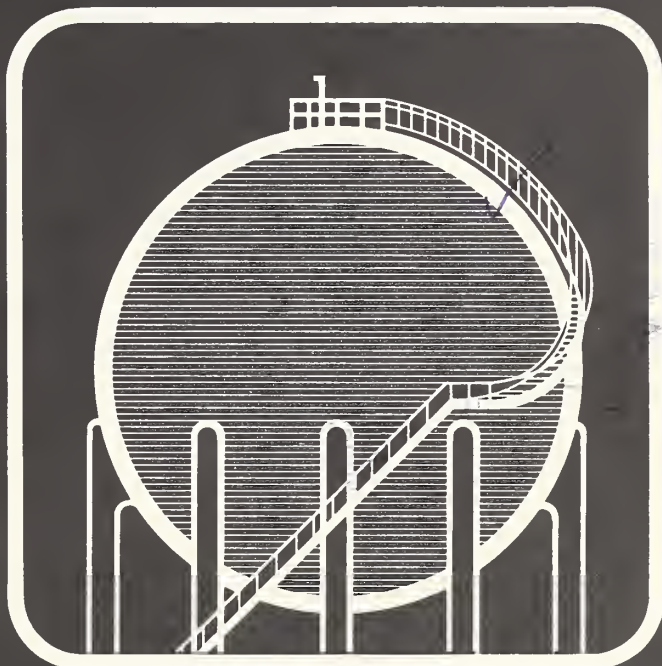
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Petroleum Cooperatives, 1982



Abstract

Petroleum Cooperatives, 1982

This study examined the vital role cooperatives played in supplying petroleum products to U.S. farms in 1982. The flow of petroleum products through the vertical levels of cooperatives' petroleum system, from crude oil acquisition to retail distribution, is analyzed, based on a survey of 20 regional and interregional cooperatives. Cooperatives supplied an estimated 37 percent of all petroleum fuels used in U.S. farm production in 1982, continuing the long-term trend in cooperatives' share growth. Between 1979 and 1982, cooperatives increased proven crude oil reserves by 45 percent.

Key words: cooperatives, petroleum, refineries, regionals, interregionals

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Highlights

Twenty regional and interregional cooperatives supplied more than 4.4 billion gallons of petroleum products in 1982. These products were provided through more than 4,000 bulk delivery and customer fill outlets.

Cooperatives produced 7.9 million barrels of crude oil from owned or leased wells in 1982, down 15 percent from 1979. During the same period, cooperatives increased proven reserves by 45 percent.

Six refineries were operated by cooperatives in 1982, down from eight in 1979. Total capacity of the six refineries was 116 million barrels per year, 1.9 percent of total U.S. capacity. They processed 84.6 million barrels of crude oil and 5.1 million barrels of natural gas liquids during 1982.

Cooperative refineries produced 1.0 billion gallons of unleaded gasoline in 1982, up 44.7 percent from 1979. Production of leaded gasoline dropped by 55.3 percent to 989 million gallons. Production of diesel and heating oil also fell between 1979 and 1982 to 1.1 million gallons, a drop of 28.6 percent.

Cooperative refineries received only 11.9 percent of their total crude oil needs through cooperative crude oil sources. Foreign spot and contract purchases provided another 27.9 percent. Domestic spot purchases represented 11.8 percent of total, domestic short-term contracts 19.3 percent, and domestic long-term contracts 29 percent. Nearly the entire volume of crude received by cooperative refineries was subject to cutoff in the event of a supply disruption.

Regional cooperatives received 1.8 billion gallons of gasoline, 1.6 billion gallons of distillate fuels, and 0.7 billion gallons of LP gas for their 1982 wholesale operations. They sold or transferred 1.9 billion gallons of gasoline, 1.8 billion gallons of distillates, and 0.7 billion gallons of LP gas, indicating significant drawdown of inventories during the year.

Eighty-one percent of all gasoline and 86 percent of all distillates sold or transferred in the cooperatives' wholesale operations went to the cooperative-owned final outlets, either bulk or customer fill stations. Outlets operated by local cooperatives received 67.8 percent of the distillate volumes shipped through regional cooperatives.

The 4,262 bulk delivery outlets and 3,639 customer fill stations served by the refined liquid fuels wholesale operations of regional cooperatives were largely owned by local cooperatives in 1982. Local cooperatives owned by their farmer members operated 85 percent of the bulk delivery centers and 77 percent of the customer fill stations. Local cooperatives operated more than 89 percent of the 1,678 bulk LP gas centers and 98 percent of the 658 LP gas customer fill centers served by regional cooperatives.

Cooperatives sold an estimated 48.3 percent of total gasoline purchases by farms for use in farm production in 1982. They also provided 25.5 percent of total diesel fuel, 43.3 percent of total LP gas, and 37 percent of all petroleum fuels used in farm production.

245 Petroleum Cooperatives, 1982

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Cooperatives play a vital role in providing petroleum products to the rural sector. In 1982, cooperatives handled more than \$5.5 billion in petroleum products. They are involved at all levels in the flow of petroleum products to the farm, including exploration, crude oil and natural gas production, refining and processing, and wholesale and retail distribution. This study, the fifth in an ongoing series conducted by ACS, examines this involvement based on a survey of 20 regional and interregional cooperatives.

There have been changes in the farm petroleum industry and cooperatives' role in it since the last study in 1979. During the early part of the 1979-82 period, cooperative refineries had difficulty in obtaining crude oil. Later, an industrywide excess of refining capacity led to problems in finding markets for finished products. Two cooperative refineries closed. Further, the price of crude oil nearly doubled while the average price of all gasolines increased 50 percent. Thus, operating margins were severely squeezed. The U.S. refining industry underwent severe restructuring, with many plants closed permanently. Several major oil companies reduced their presence in agricultural markets. Usage of petroleum products for farm production declined nearly 20 percent, which has subsequently reduced cooperatives' petroleum volume.

COOPERATIVE SYSTEM

The farmer cooperative petroleum system is composed of more than 2,800 autonomous cooperative businesses, operating under a variety of organizational arrangements at each vertical level of the petroleum industry. The nature of

cooperative involvement in the petroleum industry is described in figure 1.

Interregional cooperatives are owned by groups of regional cooperatives. Regional cooperatives, if federated, are owned by local cooperatives, and if centralized, owned directly by farmers. In all cases, control ultimately rests in the hands of cooperatives' farmer-owners.

Involvement by U.S. cooperatives in the petroleum industry begins with some

limited activity in oil exploration and crude oil production. Cooperatives' role increases substantially at the refining level with refineries owned both by regional and interregional cooperatives. At the wholesale and retail levels, the role of cooperatives in providing petroleum products to U.S. farms is fully developed. Through an extensive combination of bulk facilities and customer fill stations, local, and regional cooperatives supply a large portion of total U.S. farm petroleum needs.

Figure 1—Cooperative involvement in the petroleum industry, 1982

| Activity | Local cooperatives | Regional cooperatives | Interregional cooperatives |
|-------------------------|---|---|---|
| Oil exploration | None | Limited | Limited |
| Crude oil production | None | Limited | Limited |
| Refining | None | 4 regional owned refineries: Cenex (1), Farmland (2), and Indiana Farm Bureau (1) | 2 interregional owned refineries: National Cooperative Refinery Association, Texas City Refining Inc. |
| Pipelines | None | Own or lease limited mileage of gathering and trunk lines | Own or lease limited mileage of gathering and trunk lines |
| Wholesale distribution | Limited to a few large locals | Extensive network of storage and distribution throughout most farming regions | Moderate level of sales or transfers to noncooperative wholesalers |
| Farm sales | Extensive bulk delivery and pump station operations | Extensive bulk delivery and pump station operations | None |
| Nonfarm and urban sales | Substantial in some markets and rural communities | Substantial in some markets and rural communities | None |

CRUDE OIL PRODUCTION

In 1982, production from crude oil wells owned or leased by cooperatives was 7.9 million barrels of crude oil, down 15 percent from 1979 (table 1). During the same period, however, cooperatives increased proven reserves by 45 percent to 96.8 million barrels. Still, cooperative-owned proven reserves represented less than 1 percent of total U.S. proven reserves in 1982.

Cooperatives owned or leased a total of 8,814 gross crude oil wells in 1982, down by 1,248 from 1979, but still 703 higher than in 1969. Gross wells include all those in which cooperatives had a whole or part interest. Cooperatives owned a total of 1,961 net crude oil wells in 1982, virtually unchanged from 1969 ownership. Net wells figures include only those wholly owned or leased by cooperatives.

Cooperatives owned or leased an estimated 1,125 gross natural gas wells in 1982, continuing an upward trend in gross ownership. The net number of natural gas wells owned or leased was 342 in 1982, a decline of 229 from 1979. Total production of natural gas from cooperative wells reached a record high 27.4 billion cubic feet in 1982, up nearly threefold from 1979. Cooperatives' proven reserves of natural gas were 322.2 billion cubic feet in 1982.

The increase in reserves controlled by cooperatives is direct evidence of their efforts to insulate their systems for providing fuels to U.S. farms from future disruptions in crude oil supplies. Despite these efforts, cooperatives' production of crude oil represented a very small portion of that needed to fulfill requirements of the cooperative refining and marketing system.

Table 1—Crude oil and natural gas production by cooperatives

| Item | 1969 | | 1979 | | 1982 | |
|---|--------------------|------------------|--------------------|------------------|--------------------|------------------|
| | Gross ¹ | Net ² | Gross ¹ | Net ² | Gross ¹ | Net ² |
| <i>Number</i> | | | | | | |
| Crude oil wells owned or leased | 8,111 | 1,954 | 10,062 | 1,727 | 8,814 ³ | 1,961 |
| Gas wells owned or leased | 469 | 171 | 861 | 571 | 1,125 ³ | 342 |
| <i>Barrels</i> | | | | | | |
| Crude oil produced from owned or leased wells | 9,296,915 | | 8,683,715 | | 7,926,165 | |
| Crude oil proven reserves owned or leased | 66,732,000 | | 52,025,000 | | 96,776,571 | |
| <i>1,000 cubic feet</i> | | | | | | |
| Natural gas produced from owned or leased wells | 17,019,000 | | 9,877,000 | | 27,387,163 | |
| Natural gas proven reserves | n.a. | | n.a. | | 322,221,550 | |

n.a. = not available.

¹Gross crude oil well values include all wells cooperatives have a whole or part interest in.

²Net crude oil well values include only those wells cooperatives wholly own or lease.

³Estimate.

COOPERATIVE REFINERY OPERATIONS

Plants and Capacities

Cooperatives owned and operated six crude oil refineries in 1982 (table 2). The refineries in Texas City, TX; Laurel, MT; McPherson, KS; Phillipsburg, KS; Coffeyville, KS; and Mt. Vernon, IN, had a total refining capacity of 318,350 barrels per calendar day (b/cd).

Cooperatives operated 1.9 percent of the 16.9 million b/cd total capacity of the U.S. refining industry at the end of 1982. Two cooperative refineries closed during the 1979-82 period including a small Farmland Industries plant in Scottsbluff, NE, and the large East Chicago, IN, refinery operated by the bankrupt interregional, Energy Cooperative, Inc.

Capacity of cooperative refineries varied considerably and averaged 53,000 b/cd in 1982, down slightly from 1979 due to the ECI closure. However, it was nearly double the 26,800 b/cd average of the eight refineries operated in 1969. On average, cooperative refineries were slightly smaller than the 65,500 b/cd average for all U.S. refineries.

The total volume of crude oil refined by cooperative refineries in 1982 was 84.6 million barrels, representing 2.0 percent of the total processed by all U.S. refineries that year. Cooperative refineries also processed 5.1 million barrels of natural gas liquids in 1982 (table 3). Total input to cooperative refineries fell by 35 percent from 1979, but remained 30 percent higher than in 1969. Cooperative refineries operated at

Table 2—Number and capacity of cooperative refineries

| Refineries and capacity | Number | Capacity (b/cd) ¹ |
|-------------------------|--------|------------------------------|
| 1969 | 8 | 214,500 |
| 1979 | 8 | 459,700 |
| 1982 | 6 | 318,350 |

¹Barrels per calendar day (b/cd).

72 percent of capacity in 1982, slightly more than the 70 percent utilization rate for all U.S. refineries. The rate of utilization was considerably lower than the 82 percent achieved by cooperatives in 1979, reflecting the weak demand for petroleum products in 1982.

Products Refined

Cooperative refineries produced 1,009 million gallons of unleaded and ethanol blended gasolines in 1982, up 44.7 percent from 1979. Production of leaded gasolines fell 55.3 percent over the same period to 989 million gallons. Cooperatives produced 2.1 percent of U.S. motor gasoline production.

The six refineries produced a total of 1.3 billion gallons of distillate fuels in 1982 (includes all #1 and #2 distillates and kerosene). They produced 283 million gallons of residual oil, 110 million gallons of liquified petroleum gas (LP gas), 24 million gallons of lubricating oil, and 87 million tons of asphalt. Production of total distillates fell about 28 percent between 1979 and 1982, while LP gas production increased 12 percent.

Cooperative production of total petroleum liquids (excluding LP gas) fell 27.1 percent, from 4.95 billion gallons in 1979 to 3.61 billion gallons in 1982. The smaller decline in output of liquid fuels relative to the decline in input of crude oil reflects changes in the composition of demand for refinery products and an improvement in the overall efficiency of the cooperative refining system. This increased efficiency is a result of closure of less efficient plants and fine-tuning of the remaining plants, and reflects changes and improvements in the U.S. refining industry as a whole (table 4).

Crude Oil Sources

Cooperative refineries remained highly dependent on crude supplies over which they had little or no control despite efforts to change the situation (table 5). Cooperative refineries received only 11.9 percent of their crude oil processed

Table 3—Crude oil processed and products refined or manufactured

| Type of product | 1969 | 1979 | 1982 |
|--|--------------------------|--------------------------|---------------|
| <i>Barrels</i> | | | |
| Crude oil run or processed | 68,754,000 ¹ | 138,258,000 | 84,625,330 |
| Natural gas liquid run or processed | n.a. | n.a. | 5,082,231 |
| <i>Gallons</i> | | | |
| Unleaded gasoline - regular | n.a. | 697,759,650 ² | 965,974,473 |
| Unleaded gasoline - premium and ethanol blended gasoline | n.a. | n.a. | 43,573,047 |
| Leaded gasoline - premium | 348,402,600 | 69,281,100 | 0 |
| Leaded gasoline - regular | 1,491,877,800 | 2,142,765,450 | 989,163,814 |
| Kerosene | 62,533,800 | 316,713,600 | 169,911,672 |
| #1 fuel oil | n.a. | n.a. | 94,362,891 |
| #2 heating oil | 690,849,600 ³ | 668,067,750 ³ | 697,618,396 |
| #1 and #2 diesel fuel | 268,002,000 | 1,054,062,450 | 364,987,808 |
| Residual fuel oil (#5 and #6 and cat slurry) | n.a. | n.a. | 282,568,052 |
| Other | 116,134,200 | 0 | 0 |
| Total liquids | 2,977,800,000 | 4,948,650,000 | 3,608,160,153 |
| Liquified petroleum gas | 81,354,000 | 97,751,556 | 109,988,620 |

n.a. = not available.

¹One refinery processed a substantial quantity of stocks other than crude oil.

²Includes unleaded regular and premium. ³Includes #1 and residual fuel oil.

Table 4—Productivity of U.S. and cooperative refineries by major product class, 1979 and 1982

| Item | All U.S. refineries ¹ | | Cooperative refineries | |
|-------------------------------------|----------------------------------|--------|------------------------|-------|
| | 1979 | 1982 | 1979 | 1982 |
| <i>1,000 barrels per day</i> | | | | |
| Refinery inputs: | | | | |
| Crude oil | 14,648 | 11,774 | 360.0 | 231.9 |
| Liquified petroleum gas | 236 | 300 | 18.9 | 13.9 |
| Total | 14,884 | 12,074 | 378.9 | 245.8 |
| Products: | | | | |
| Finished gasolines | 6,852 | 6,338 | 189.7 | 130.3 |
| Distillate fuels | 3,153 | 2,606 | 133.0 ² | 75.5 |
| Residual oil | 1,321 | 1,070 | (²) | 18.4 |
| <i>Percent</i> | | | | |
| Products as a percent of inputs: | | | | |
| Finished gasolines | 46.0 | 52.5 | 50.1 | 53.0 |
| Gasoline and distillates | 67.2 | 74.1 | n.a. | 83.7 |
| Gasoline, distillates, residual oil | 76.1 | 82.9 | 85.2 | 91.2 |

¹Source: DOE/EIA-0035 "Monthly Energy Review."

n.a. = not available.

²Residual fuel oils included in distillate total in 1979.

Table 5—Sources of crude oil received by cooperative refineries, 1982

| Source | Barrels | Percent |
|---------------------------------|------------|---------|
| Cooperative | 9,994,412 | 11.9 |
| Domestic spot purchases | 9,908,546 | 11.8 |
| Domestic contracts (short term) | 16,261,340 | 19.3 |
| Domestic contracts (long term) | 24,480,087 | 29.1 |
| Foreign spot purchases | 15,905,270 | 18.9 |
| Foreign source contracts | 7,561,567 | 9.0 |
| Total | 84,111,222 | 100.0 |

volume from their own or other cooperative suppliers. Domestic sources of supply provided another 60.2 percent, while foreign sources provided the remainder.

Domestic long-term contracts (duration in excess of 1 year) were the most important sources of crude for the cooperative refiners, providing 29.1 percent. Short-term domestic contracts and domestic spot purchases provided 19.3 percent and 11.8 percent, respectively. Two-thirds of cooperatives' foreign source supplies came through spot transactions, representing 18.9 percent of total cooperative refinery needs.

Cooperative refineries indicated that more than 90 percent of their total crude supplies were subject to cutoffs or cut-backs in the event of supply disruptions. In addition to the supply shortages, reliance on noncooperative crude sources would give cooperatives and their farmer-members little insulation from rapid price escalation.

Storage Facilities

Storage for crude oil and refined liquids at cooperatives refineries underwent significant change between 1979 and 1982. As a measure to lower the probable impacts of a short-term crude supply curtailment, cooperative refineries increased their crude oil storage capacity

Table 6—Bulk storage capacities at cooperative refineries and nonrefinery sites

| Type of storage | 1969 | 1979 | 1982 |
|--|------------------|------------------|------------|
| | Barrels | | |
| Crude oil | 2,756,000 | 3,784,000 | 5,372,725 |
| Motor gasoline | (¹) | (¹) | 7,118,745 |
| Distillate fuel and kerosene | (¹) | (¹) | 4,557,883 |
| Residual fuel oil | (¹) | (¹) | 699,273 |
| Refined liquid fuels | 7,590,455 | 15,822,100 | 12,375,901 |
| LP gas | n.a. | n.a. | 2,677,959 |
| Lubricating oils, asphalt, blending stock and others | n.a. | n.a. | 312,731 |

n.a. = not available.

¹ Combined figure only for 1969 and 1979.

by 42 percent to 5.4 million barrels in 1982 (table 6). As a group, crude oil storage capacity at cooperative refineries equaled a 17-day operating supply in 1982, compared with a supply for about 8 operating days in 1979.

Storage capacity for refined liquid products did not follow the same trend. Storage capacity for refined products fell 21.8 percent to 12.4 million barrels between 1979 and 1982, primarily because of the two refinery closings. Refined product storage capacity equaled 39 days' output in 1982, compared with 34 days' output in 1979.

Crude Oil and Refinery Product Transportation

Pipelines were the most important method of transporting crude oil to cooperative refineries, handling 60.9 percent of refinery receipts in 1982. Barges and vessels transported 29.8 percent and trucks handled the remaining 9.3 percent (table 7). Pipelines were of even greater importance in transporting of liquid fuels from cooperative refineries, handling 71.5 percent. Trucks hauled most of the remaining liquid fuels. Pipelines and trucks were of nearly equal importance in refinery shipments of LP gas, handling 45.1 and 41.3 percent, respectively. Refineries operated 95 highway transports of at least 2,000-

gallon capacity, in 1982, compared with 49 in 1979.

Cooperative refiners owned or leased 3,668 miles of pipelines in 1982 (table 8). Of this, 1,907 miles was jointly owned or leased with other organizations. Cooperative refiners solely owned or leased 347 miles of trunk pipeline and 1,414 miles of gathering lines.

Destination of Refinery Product Shipments

Cooperatives were the most important direct recipients of petroleum products shipped by cooperative refiners in 1982, receiving 76 percent of refinery shipment volumes (table 9). A significant portion of product shipments to non-

Table 7—Transportation modes for crude oil receipts and product shipments by cooperative refineries, 1982

| Transportation mode | Crude oil receipts by refineries | Refinery shipments of: | |
|---------------------|----------------------------------|------------------------|--------|
| | | Liquid fuels | LP gas |
| | | Percent | |
| Pipeline | 60.9 | 71.5 | 45.1 |
| Truck | 9.3 | 24.7 | 41.3 |
| Barge or vessel | 29.8 | 3.2 | 0 |
| Rail | 0 | 0.6 | 13.6 |

Table 8—Pipeline mileage owned or leased by cooperative refineries

| Type of pipeline | 1969 | 1979 | 1982 |
|--------------------------|--------------|-------|-------|
| | <i>Miles</i> | | |
| Wholly owned or leased: | | | |
| Gathering | 1,201 | 1,476 | 1,414 |
| Trunk | 272 | 176 | 347 |
| Jointly owned or leased: | | | |
| Gathering and trunk | n.a. | n.a. | 1,907 |

n.a. = not available.

cooperative buyers must be considered as an indirect source of products for the wholesale operations of cooperatives. Also, products frequently are exchanged among cooperative and other refiners to balance supplies in a given geographic area.

WHOLESALE MARKETING AND DISTRIBUTION

At the wholesale level, cooperatives experienced significant declines in volumes handled for nearly all petroleum products between 1979 and 1982. These declines reflected the overall reduction in volume of petroleum products used on farms and throughout the U.S. economy over this period. Volumes handled in 1982 remained well above 1969 volumes for all petroleum products.

Products Received

Cooperatives received 1.8 billion gallons of motor gasolines in their wholesale operations in 1982, down 39 percent from 1979 (table 10). Leaded regular gasoline was by far the most important, representing 74 percent of total gasoline receipts.

Receipts of distillate fuels by cooperative wholesalers followed a similar pattern. The volume of distillate fuels received fell 35 percent between 1979 and 1982. Of the total 1.6 billion gallons of distillates received by cooperative wholesalers, heating oil and diesel fuel were most important, representing 49 and 38 percent of total distillates

Table 9—Refinery sales or transfers by product and type of product recipient, 1982

| Product | Recipient | |
|--|----------------|--------------|
| | Cooperatives | Other buyers |
| | <i>Percent</i> | |
| Motor gasoline | 76.1 | 23.9 |
| Distillate fuel and kerosene | 87.3 | 12.7 |
| Residual fuel oil and cat cracker slurry | 2.0 | 98.0 |
| LP gas | 84.8 | 15.2 |
| Lubricating oil | 65.6 | 34.4 |
| Solid products ¹ | 0 | 100.0 |

¹Includes asphalt, coke, and others.

Table 10—Quantity of petroleum products received by regional cooperatives for wholesaling operations

| Product | Year | | |
|-----------------------------|----------------------|------------------------|-----------|
| | 1969 | 1979 | 1982 |
| | <i>1,000 gallons</i> | | |
| Unleaded gasoline - regular | n.a. | n.a. | 440,117 |
| Unleaded gasoline - premium | n.a. | n.a. | 16,049 |
| Leaded gasoline - regular | n.a. | n.a. | 1,338,478 |
| Leaded gasoline - premium | n.a. | n.a. | 1,045 |
| Ethanol blended gasoline | n.a. | n.a. | 15,224 |
| All gasoline | 1,606,714 | 2,986,113 | 1,810,913 |
| Kerosene | 42,061 | (²) | 62,222 |
| #1 fuel oil | (¹) | (²) | 98,316 |
| #2 heating oil | 804,759 ¹ | 1,178,157 ² | 780,136 |
| #1 and #2 diesel fuel | 350,505 | 1,265,026 | 607,677 |
| #4 fuel oil | (¹) | (²) | 940 |
| Residual oil (#5 and #6) | (¹) | (²) | 36,016 |
| All distillate fuels | 1,197,325 | 2,443,183 | 1,585,307 |
| LP gas | 529,250 | 895,568 | 731,146 |
| Lubricating oil | 36,239 | 50,273 | 37,946 |
| | <i>Tons</i> | | |
| Grease | 6,894 | 7,868 | 8,063 |

n.a. = not available.

¹#1, #2, and #4 fuel oils combined with residual oils (#5 and #6).

²#1, #2, and #4 fuel oils combined with kerosene and residual oils (#5 and #6).

received, respectively. The volume of LP gas received also fell between 1979 and 1982, but not to the same degree.

Cooperative wholesalers received 731 million gallons of LP gas, down 18 percent from 1979. Lubricating oil receipts fell 25 percent to 38 million gallons, while grease posted a slight increase to 8,063 tons.

Sources of Products

Cooperative refineries were the most important sources of petroleum products handled by cooperatives in 1982 (table 11). Cooperative wholesalers received more than two-thirds of their motor gasolines and distillate fuels directly from cooperative refineries either via pipeline or highway transport, or indirectly through product exchange arrangements. Use of these arrangements is most apparent in comparing unleaded regular and diesel fuel volumes received by wholesalers with those volumes produced at cooperative refineries (table 3).

Contracts with noncooperative domestic suppliers and spot market purchases were of nearly equal importance for the remaining volume for most petroleum products handled by cooperative wholesalers. LP gas is the most notable exception. More than 62 percent of the LP gas received by cooperative wholesalers came through contracts with noncooperative domestic suppliers. The volume of LP gas produced at cooperative refineries represented only about 15 percent of the total requirements of cooperative wholesalers.

Disposition of Products

Petroleum products handled by survey cooperatives at the wholesale level were distributed to a combination of final outlets. These outlets, including both bulk delivery centers and customer fill stations, were operated by the regionals themselves, local cooperatives, non-cooperative retailers, and other wholesalers (table 12). Regional cooperatives operating final outlets were typically centralized regionals.

Table 11—Source of petroleum products for regional cooperative wholesale operations, 1982

| Product | Cooperative refineries | Spot purchases | Contracts with domestic sources |
|---------------------------|------------------------|----------------|---------------------------------|
| <i>Percent</i> | | | |
| All gasolines | 75.9 | 13.5 | 10.6 |
| Kerosene | 83.6 | 10.8 | 5.6 |
| *1 | 66.1 | 16.5 | 17.4 |
| *2 diesel and heating oil | 70.8 | 16.4 | 12.8 |
| LP gas ¹ | 10.3 | 18.2 | 62.2 |
| Lubricating oil | 59.6 | 5.1 | 35.3 |
| Grease | 47.6 | 32.5 | 19.9 |

¹Contracts with non-U.S. sources provide 9.3 percent of the LP gas.

Table 12—Quantity of petroleum products sold or transferred by cooperative wholesalers to each category of final outlet

| Petroleum product | Final outlet | | | |
|-------------------------------|------------------|-------------------|------------------|------------------|
| | Regional owned | Local co-op owned | Nonco-op owned | Other |
| <i>1,000 gallons</i> | | | | |
| Unleaded gasoline - regular | 68,002 | 276,188 | 51,687 | 60,105 |
| Unleaded gasoline - premium | 6,341 | 3,113 | 3,500 | 3,002 |
| Leaded gasoline - regular | 171,553 | 1,002,492 | 138,879 | 108,815 |
| Leaded gasoline - premium | 0 | (¹) | (¹) | 0 |
| Ethanol blended gasoline | 729 | 15,271 | 4,602 | 0 |
| All gasoline | 246,625 | 1,297,064 | 198,668 | 171,922 |
| Kerosene | 44,196 | 10,482 | 2,676 | 6,076 |
| *1 Fuel oil | 3,760 | 109,131 | 7,032 | (²) |
| *2 heating oil | 234,043 | 432,657 | 43,442 | 97,897 |
| *1 and *2 diesel fuel | 67,679 | 576,975 | 48,938 | 14,870 |
| *4 fuel oil | (³) | 40,539 | 39,569 | (⁴) |
| Residual fuel oil (*5 and *6) | 0 | (³) | (⁴) | 0 |
| All distillate fuels | 349,678 | 1,169,784 | 141,657 | 118,843 |
| LP gas | 54,495 | 657,262 | 10,170 | 1,872 |
| Lubricating oil | 2,645 | 22,923 | 1,808 | 8,836 |
| <i>Tons</i> | | | | |
| Grease | 2,441 | 4,387 | 710 | 354 |

¹Leaded gasoline-premium combined with ethanol blended gasoline in their respective final outlets.

²Combined with noncooperative-owned final outlet.

³Combined with *4 fuel oil in local cooperative-owned final outlet.

⁴Combined with *4 fuel oil in noncooperative-owned final outlet.

Table 13—Distribution of cooperative wholesale petroleum deliveries, by region, 1982¹

| Region ² | Motor gasoline | Distillate fuels | LP gas | Lubricating oil |
|----------------------------------|----------------|------------------|--------|-----------------|
| Northeast | 11.7 | 18.2 | 5.3 | 16.9 |
| Lake States | 17.1 | 16.3 | 19.2 | 12.4 |
| Corn Belt | 30.5 | 29.2 | 37.6 | 17.1 |
| Northern Plains | 19.7 | 17.5 | 25.9 | 17.2 |
| Appalachian and Southeast | 5.0 | 5.2 | 2.8 | 1.4 |
| Delta States and Southern Plains | 6.5 | 6.1 | 4.3 | 27.8 |
| Mountain and Pacific | 9.6 | 7.6 | 4.9 | 7.0 |

¹May not add due to rounding.

²Northeast: ME, NH, VT, NY, MA, RI, CN, PA, NJ, DL, MD. Lake States: MI, WI, MN. Corn Belt: OH, IN, IL, IA, MO. Northern Plains: ND, SD, NE, KS. Appalachian: VA, WV, KY, TN, NC. Southeast: SC, GA, AL, FL. Delta States: MS, LA, AR. Southern Plains: OK, TX. Mountain: MT, ID, WY, CO, UT, NV, AZ, NM. Pacific: WA, OR, CA, HI, AK.

Table 14—Number and total capacity of cooperative wholesaler storage terminals¹, by major product group, 1982

| Products | Number of terminals | Total capacity |
|-----------------|---------------------|----------------|
| | Number | 1,000 gallons |
| Motor gasolines | 47 | 136,883 |
| Distillates | 54 | 314,683 |
| LP gas | 9 | 96,461 |

¹Does not include storage terminals at refinery sites.

Outlets operated by local cooperatives received the largest share of regional wholesale deliveries for most petroleum products. Local outlets received 68 percent of all regional deliveries of motor gasolines and 66 percent of all distillate deliveries. Ninety-one percent of all regional LP gas deliveries went to local cooperative outlets.

Outlets operated by regional cooperatives received 13 percent of all motor gasoline wholesale deliveries and 20 percent of all distillates. Regional outlets received significantly higher proportions of kerosene, unleaded premium gasoline, and grease. The various non-cooperative outlets and buyers were important recipients of unleaded gasolines, ethanol blends, and lubricating oil.

These outlets were of minor importance for other products.

The Corn Belt, Northern Plains and Lake States were the most important areas for petroleum cooperatives in terms of total volumes distributed (table 13). The three regions accounted for 67 percent of total gasoline volume, 63 percent of distillates, and 83 percent of LP gas.

Refined Product Storage and Transportation

Cooperative wholesalers operated 110 storage terminals for liquid fuels in 1982 (table 14). Motor gasolines were stored at 47 terminals, which had an average capacity of 2.9 million gallons. These ter-

minals had capacity equal to a 26-day gasoline supply for the cooperatives' wholesaling operations. Distillate fuels were stored at 54 terminals, with an average capacity of 5.8 million gallons. These terminals could hold the equivalent of a 64-day supply of distillates for cooperative wholesalers. Nine LP gas storage terminals were reported. These had average capacity of 10.7 million gallons and could hold up to a 48-day supply. In many cases, storage terminals listed here as separate facilities are at the same site.

The survey cooperatives operated 1,152 highway transports in 1982, with a capacity of 2,000 gallons or more. Slightly more than half of these, 595, were used for transporting refined liquid fuels.

Most of the remaining transports distributed LP gas (table 15). Cooperative wholesalers delivered 57.5 percent of their total wholesale deliveries of LP gas and 53.6 percent of total motor gasoline and distillate deliveries using their own transports. Transports owned by trucking firms, independent truckers, and final outlets handled the remaining deliveries.

The 1,152 transports logged 36.2 million miles in delivering petroleum products to final outlets. Transports traveled an average of 31,400 miles each and ranged from 11,500 to 108,000 miles. Factors affecting average miles per transport include density of wholesale delivery points and the number and location of

Table 15—Highway transports used in regional cooperative wholesale operations

| Item | 1969 | 1979 | 1982 |
|--|------|------|------------|
| <i>Number</i> | | | |
| Highway transports (with 2,000+ gallon capacity) operated for: | | | |
| Liquid fuels | 331 | 804 | 595 |
| LP gas | 156 | 243 | 514 |
| Other | n.a. | n.a. | 43 |
| <i>Miles</i> | | | |
| Fleet miles logged by highway transports: | n.a. | n.a. | 36,198,731 |

n.a. = not available

storage terminals. The average transport delivered 2,085,000 gallons of liquid fuels in 1982.

BULK DELIVERY AND RETAIL OPERATIONS

More than 2,800 U.S. cooperatives handled petroleum products in 1982. These cooperatives, both regional and local, had a net petroleum product sales volume of \$5.5 million in nearly all States. This net business volume primarily involved sales to end users, primarily farmers, through bulk delivery centers or customer fill stations. The importance of cooperative final outlets for farms and rural communities has increased as major oil firms have reduced their presence in many of these areas.

Partial responses from survey cooperatives indicated cutbacks or withdrawals by major oil company retailers in 279 counties between 1979 and 1982. These counties contained about 187,000 farms. Cooperatives and independent refiners, distributors, and dealers have been left with responsibility in these markets, and frequently have become the only suppliers available to farmers and rural residents.

Final Outlets

Motor gasolines and distillate fuels supplied through the survey cooperatives moved through 4,261 bulk delivery centers and 3,639 customer fill stations in 1982 (table 16). Bulk delivery centers and customer fill centers were often located at the same site. Outlets operated by local cooperatives made up more than 75 percent of all outlets. On average, gasoline and distillate outlets owned by locals did roughly half the sales volume of those operated by regional cooperatives. Customer fill stations were the more common type of outlet for non-cooperative recipients of petroleum products from regional cooperatives.

LP gas supplied by survey cooperatives was sold through 1,678 bulk delivery centers and 658 customer fill stations in

Table 16—Final outlets for petroleum products supplied by regional cooperative wholesalers, 1982

| Product/outlet operator | Type of outlet | |
|-------------------------|-----------------------|------------------------|
| | Bulk delivery centers | Customer fill stations |
| | Number | |
| Refined liquid fuels: | | |
| Regional owned | 322 | 236 |
| Local cooperative owned | 3,612 | 2,800 |
| Noncooperative owned | 327 | 603 |
| Total | 4,261 | 3,639 |
| LP gas: | | |
| Regional owned | 176 | 13 |
| Local cooperative owned | 1,498 | 645 |
| Noncooperative owned | 4 | 0 |
| Total | 1,678 | 658 |

Table 17—Liquid petroleum and LP gas bulk delivery centers served by cooperative wholesalers, by operator type and by region, 1982

| Region | Type of operator | | |
|--|----------------------|-------------------|-------------|
| | Regional cooperative | Local cooperative | Other firms |
| | Number | | |
| Northeast | 129 | 16 | 143 |
| Lake States | 13 | 859 | 67 |
| Corn Belt | 138 | 1,156 | 11 |
| Northern Plains | 0 | 806 | 14 |
| Appalachia | 38 | 75 | 247 |
| Southeast, Delta States, and Southern Plains | 109 | 244 | 1 |
| Mountain and Pacific | 0 | 456 | 17 |

1982. Local cooperatives operated more than 90 percent of these outlets. Non-cooperative outlets for LP gas were not major recipients of supplies from regional cooperatives. The average volume of LP gas handled at final outlets was about the same for local and regional cooperatives.

There were significant differences among the regions in the mixture of outlet operators receiving petroleum products from cooperative wholesalers (table 17). Local cooperative bulk centers were dominant in the Lake States, Corn Belt, Northern Plains, and Mountain and Pacific regions. In relative

terms, regional operated bulk centers played the largest role in the Northeast, Appalachia, and the Southern regions. Bulk delivery centers operated by non-cooperative firms were important outlets for cooperative suppliers in the Northeast and Appalachia regions.

An estimated 650,000 establishments received bulk deliveries of petroleum from local and regional cooperative bulk delivery centers. About 75 percent were operating farms. Many more farms, businesses, and individuals were served through cooperatives' customer fill stations; however, no estimates were made in this study.

Table 18—Cooperatives' share of fuel used for farm production

| Year/product | Fuel used for farm production, U.S. ¹ | Fuel sold by cooperatives for farm production | Cooperatives' share of U.S. farm production fuel usage |
|-----------------------|--|---|--|
| | -----1,000 gallons----- | | Percent |
| 1982 | | | |
| All gasolines | 2,385,241 | 1,151,058 | 48.3 |
| Diesel fuel | 2,931,690 | 747,931 | 25.5 |
| Total liquids | 5,316,931 | 1,898,989 | 35.7 |
| LP gas | 1,136,167 ² | 491,682 | 43.3 |
| Total petroleum fuels | 6,453,098 | 2,390,671 | 37.0 |
| 1979 | | | |
| All gasolines | 3,381,130 | 1,653,765 | 48.9 |
| Diesel fuel | 3,178,766 | 1,314,703 | 41.4 |
| Total liquids | 6,559,896 | 2,968,468 | 45.3 |
| LP gas | 1,301,867 | 553,660 | 42.5 |
| Total petroleum fuels | 7,861,763 | 3,522,128 | 44.8 |
| 1969 | | | |
| All gasolines | 5,169,000 | 1,431,268 | 27.7 |
| Diesel fuel | 1,505,000 | 292,248 | 19.4 |
| Total liquids | 6,674,000 | 1,723,516 | 25.8 |
| LP gas | 2,354,000 | 504,229 | 21.4 |
| Total petroleum fuels | 9,028,000 | 2,227,745 | 24.7 |

¹Farm Petroleum Use Survey, SRS, USDA, unpublished data. ²Estimate.

The distinction between the cooperatives' bulk petroleum centers and customer fill stations has become increasingly blurred in recent years. In many areas, patrons at fill stations are now able to pick up bulk quantities by using their own equipment. Some cooperatives have established 24-hour self-service stations with magnetic card billing systems. This has enabled both bulk patrons and smaller volume retail buyers better access to petroleum supplies and decreased operating cost.

Cooperatives' Share of Petroleum Expenditures for Farm Production

Cooperatives accounted for an estimated 48.3 percent of total gasoline expenditures for use in farm production in 1982 (table 18). They provided 25.5 percent of total diesel fuel and 43.3 percent of

total LP gas used in farm production. In total, cooperatives provided an estimated 37 percent of the petroleum fuels used in farm production, down from the abnormal supply year in 1979.

Longer term trends of the growing importance of cooperatives in providing fuel to U.S. farms continued, as cooperatives provided a significantly higher proportion of all fuels compared with 1969 and earlier. There were differences among regions in the share of farm production fuel purchases made through cooperatives. Cooperatives handled large shares in the Corn Belt, Lake States, Northeast, and Northern Plains, and smaller shares in other regions.

PETROLEUM PRODUCT PRICING

Prices received by cooperatives in both wholesale and retail petroleum opera-

tions are determined primarily through supply and demand. Minor adjustments to these market determined price levels may then be made to reflect the costs of serving a particular product market or to respond to a competitive situation in a given local area.

The weighted average prices received by regional cooperatives for petroleum products delivered to final outlets are shown in table 19. Wholesale price averages include both actual prices paid under sales transactions and transfer prices assigned on delivery of products to outlets owned by centralized regional cooperatives. The range in wholesale prices as a percent of average price was considerably smaller for most distillate fuels than for motor gasolines. The largest range in prices among respondents was for kerosene and LP gas.

The weighted average delivered prices received by cooperatives for bulk delivered petroleum products are shown in table 20. These price averages contain both price and delivery cost components. They were based primarily on responses by centralized regionals from records of their own bulk delivery outlets. The range of prices as a percent of average retail price displayed more uniformity among products than was evident at the wholesale level. The range for distillate fuel retail prices was about the same as for the motor gasolines.

On the basis of only those products having at least seven respondents at the bulk delivery level, it appears that the percent markup over wholesale price (price spread/wholesale price) tends to be smallest for diesel and #1 fuel oil. The markup on kerosene tends to be largest, while on motor gasolines and heating oil it falls in the middle range. Differences among products may be attributed to several factors including acquisition cost conditions and size of average delivery. Given the different mix and small number of respondents represented in data contained in tables 19 and 20, analysis of product price spreads between the wholesale and bulk delivery levels is subject to potential error.

Table 19—Average wholesale prices for petroleum products delivered to final outlets by regional cooperatives, 1982

| Product | Delivered price ¹ | Range as percent of average price | Number of respondents |
|-----------------------------|------------------------------|-----------------------------------|-----------------------|
| | <i>Dollars/gallon</i> | <i>Percent</i> | <i>Number</i> |
| Unleaded gasoline - regular | 0.9940 | 0.2394 | 13 |
| Unleaded gasoline - premium | 1.0674 | .2633 | 5 |
| Leaded gasoline - regular | .9696 | .2492 | 13 |
| Ethanol blended gasoline | 1.0877 | .0980 | 6 |
| Kerosene | 1.0427 | 1.0357 | 10 |
| *1 fuel oil | 1.0314 | .1299 | 9 |
| *2 heating oil | .9586 | .1292 | 12 |
| *1 and *2 diesel fuel | .9774 | .1709 | 14 |
| LP gas | .4313 | .8740 | 9 |

¹Weighted by volumes.

Table 20—Average delivered prices received for bulk delivered petroleum products, 1982

| Product | Delivered price ¹ | Range as percent of average price | Number of respondents |
|-----------------------------|------------------------------|-----------------------------------|-----------------------|
| | <i>Dollars/gallon</i> | <i>Percent</i> | <i>Number</i> |
| Unleaded gasoline - regular | 1.1705 | 0.2196 | 8 |
| Unleaded gasoline - premium | 1.2157 | .2130 | 4 |
| Leaded gasoline - regular | 1.1279 | .2128 | 8 |
| Ethanol blended gasoline | 1.2068 | .0912 | 3 |
| Kerosene | 1.2979 | .2404 | 7 |
| *1 fuel oil | 1.1522 | .1658 | 7 |
| *2 heating oil | 1.1220 | .2478 | 7 |
| *1 and *2 diesel fuel | 1.0872 | .2557 | 8 |
| LP gas | .6692 | .2615 | 5 |

¹Weighted by volume.

NOTE: Prices received at retail customer fill outlets are not shown due to insufficient data.

CHALLENGES FACING PETROLEUM COOPERATIVES

During the past decade, cooperatives have been faced with significant challenges to the long-term health and structure of their petroleum operations. They have met these challenges but not without considerable stress and readjustment. The upcoming decade will offer further challenges to individual cooperatives and the cooperative system. Among them:

1. *Security of product flow.* The moves taken by cooperatives to strengthen the

security of the flow of petroleum products through the cooperative system were in the right direction but fell considerably short of achieving full protection. The vulnerabilities, paralleled in other parts of the U.S. agricultural petroleum supply system, which were present in the system in 1979, remain. Without a formal program to direct crude oil supplies in the event of major disruption, farmers face the possibility of being unable to obtain fuel supplies at critical planting or harvest periods.

Cooperatives may respond to this continued challenge internally through

direction of their investments, and externally through efforts to obtain legislated programs. The internal issues that cooperatives must address are many. Is increased acquisition of crude reserves the proper route? If so, how much is enough to meet goals for security, and at what cost? Where in the cooperatives' petroleum system should investment be focused to provide the most cost effective measure of supply security?

2. *Increase in Refined Product Imports.* Downward pressures on crude oil prices have coupled with a strong U.S. dollar to push the growth of refined petroleum product exporting by several oil rich nations. This import competition will continue to squeeze refining margins for cooperative refiners and other domestic refiners who lack adequate crude oil supplies. Cooperatives must seek ways to counter this import threat and ensure their ability to remain in the refining business over the long haul.

3. *Design of cooperative distribution network.* In several geographic areas, considerable overlap exists among the service territories of a number of cooperatives. This situation is present both at the regional and local cooperative level. This creates opportunities to improve the structure of wholesale distribution and bulk delivery to farms by eliminating duplicated functions and services.

4. *Change in U.S. farming structure.* In petroleum, as in all other areas of cooperative business, the changing structure of farming will require substantial adaptation by cooperatives. The decline in total farm numbers, the increase in average farm size, the increase in technical and managerial capabilities on farms, and the increasing divergence between small and large farms will greatly affect the nature of cooperative products, services, and programs.

5. *Changing product mix.* As the phaseout of leaded gasoline continues, cooperatives will have to adapt refineries, distribution facilities, and final outlets to han-

dle a different product mix. Growth in the role of ethanol blended gasolines or development of substitute plant-based fuels could require even more extensive changes in petroleum plant, equipment, and supply procurement. Growth in farm demand for diesel fuels as a substitute for gasoline will likely continue. Cooperatives will be challenged to maintain the allegiance of their former gasoline buyers as they make this transition.

6. *Change in the overall petroleum industry.*

The economic and business forces facing cooperatives also affects to varying degrees all other participants in the petroleum industry. Changes in operations and business strategies adopted by integrated oil companies, independent refiners and marketers, and firms dealing in agricultural petroleum markets will affect traditional buyer-seller relationships and methods of doing business. Cooperatives will need to assess these changes and position themselves to respond in a manner that maintains and strengthens their role in providing fuel for farmers.

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Appendix table 1 — Regional and interregional petroleum cooperatives' structure, members, and type of operations, December 31, 1982

| Cooperative and headquarters | Members | Operations | | Refining | | Crude production | |
|--|--------------------|------------|------------------|-------------------|-------------------------------|-------------------|-------------------------------|
| | | Retailing | Whole- saling | Own facilities | Through inter- regional | Own facilities | Through inter- regional |
| Federated cooperatives: | | | | | | | |
| Alabama Farmers Coop., Decatur, AL | 54 locals | — | X | — | — | — | — |
| CENEX, St. Paul, MN | 1,600 locals | — | X | X | X ¹ | X | X ¹ |
| Delta Purchasing Fed., Greenwood, MS | 10 locals | — | X | — | — | — | — |
| Farmland Industries, Kansas City, MO | 2,286 locals | — | X | X | X ¹ | — | X ² |
| Growmark Inc., Bloomington, IL | 112 locals | — | X | — | X ¹ | — | X |
| Indiana Farm Bureau Coop. Assn., Indianapolis, IN | 67 locals | — | X | X | — | X | X ³ |
| Landmark, Inc., Columbus, OH | 43 locals | — | X | — | — | — | — |
| Southern Farmers Assn., Little Rock, AR | 92 locals | — | X | — | — | — | — |
| Tennessee Farmers Coop., LaVergne, TN | 81 locals | — | X | — | — | — | — |
| Waterloo Service Co., Waterloo, IA | 99 locals | — | X | — | — | — | — |
| Centralized cooperatives: | | | | | | | |
| Agway Inc., Syracuse, NY | 110,000 farmers | X | X | — | X ⁴ | — | X ⁴ |
| FCX, Inc., Raleigh, NC | 54,000 farmers | X | — | — | — | — | — |
| Gold Kist, Inc., Atlanta, GA | 87,000 farmers | X | — | — | — | — | — |
| Maine Potato Growers, Presque Isle, ME | 850 farmers | X | — | — | — | — | — |
| MFA Oil Co., Columbia, MO | 25,104 farmers | X | X | — | X ¹ | — | X ¹ |
| Mixed cooperatives: ⁵ | | | | | | | |
| Farmers Petroleum Coop. Lansing, MI | 9,600 farmers | | | | | | |
| | 70 locals | X | X | — | — | — | — |
| Land O'Lakes, Minneapolis, MN | 11,036 farmers | | | | | | |
| | 1,236 locals | X | X | — | X ¹ | — | X ² |
| MFC Services, Madison, MS | farmers | | | | | | |
| | 103 locals | X | X | — | — | — | — |
| Southern States Coop., Richmond, VA | 82,701 farmers | | | | | | |
| | 114 locals | X | X | — | X ⁴ | — | X ⁴ |
| Interregional cooperatives: | | | | | | | |
| Agri-Petco Int'l, Tulsa, OK | 1 regional | | | | | | |
| | 2 interregionals | — | — | — | — | X | — |
| Int'l Coop. Petro. Assn., NY, NY | 2 U.S. regionals | | | | | | |
| | European regionals | — | X | — | — | — | — |
| Nat'l Coop. Ref. Assn., McPherson, KS | 5 regionals | — | — | X | — | — | X ³ |
| Texas City Ref. Inc. Texas City, TX | 2 regionals | — | — | X | — | — | X ³ |

¹Member of National Cooperative Refinery Association.

²Member of International Cooperative Petroleum Association.

³Member of Agri-Petco International.

⁴Member of Texas City Refining.

⁵Farmer numbers represent direct membership only.

**U.S. Department of Agriculture
Agricultural Cooperative Service**

Agricultural Cooperative Service (ACS) provides research, management, and educational assistance to cooperatives to strengthen the economic position of farmers and other rural residents. It works directly with cooperative leaders and Federal and State agencies to improve organization, leadership, and operation of cooperatives and to give guidance to further development.

The agency (1) helps farmers and other rural residents develop cooperatives to obtain supplies and services at lower cost and to get better prices for products they sell; (2) advises rural residents on developing existing resources through cooperative action to enhance rural living; (3) helps cooperatives improve services and operating efficiency; (4) informs members, directors, employees, and the public on how cooperatives work and benefit their members and their communities; and (5) encourages international cooperative programs.

ACS publishes research and educational materials and issues *Farmer Cooperatives* magazine. All programs and activities are conducted on a nondiscriminatory basis, without regard to race, creed, color, sex, or national origin.